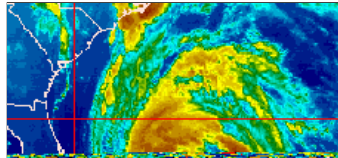




Hazards Support Activities



Severe weather

*hurricanes
thunderstorms
tornadoes
winter storms
heat
droughts
floods*



Geophysical activity

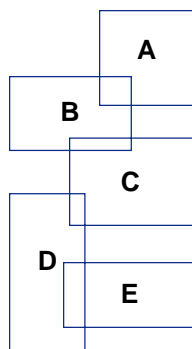
*volcanoes
earthquakes
tsunamis*



Extreme biological events

*harmful algal blooms
nonindigenous species
persistent hypoxia*

Contents



Cover Images:

A. Hurricane Fran, 1996
(NOAA Public Affairs).

B. Floodwaters, Saint
Genevieve, Missouri, 1993.
(Photo by Andrea Booher,
Federal Emergency
Management Agency.)

C. Eruption of Mount Saint
Helens, Washington, 1980
(NESDIS photo archive).

D. Earthquake damage,
Santa Cruz, California, 1989
(NESDIS photo archive).

E. Photomicrograph of
Dinophysis acuta and
Dinophysis norvegica,
harmful algal species.
(Photo by Don Anderson,
Woods Hole Oceanographic
Institution.)

Other Credits:

All photographs used with
permission. Photo montage,
page 11, from the GLOBE
Program; page 18 by Janet
Ward, NOAA. Publication
designed and edited by Joy
Ikelman, NOAA/NESDIS.

NESDIS Assets for Observing, Analyzing, and Assessing Hazards

- 3 Geostationary Satellites
- 3 Polar-Orbiting Satellites
- 4 Other Satellites
- 4 National Data Centers

Detecting and Monitoring Hazards Events

- 4 Wind Monitoring
- 4 Volcanic Ash Advisory Statements
- 5 Wildfire Detection
- 5 Precipitation Estimates
- 5 Tracking Tropical Cyclones
- 5 Monitoring Thunderstorms and Tornadoes
- 6 El Niño and La Niña

Responding to Natural Hazards Events

- 6 Significant Events Notification
- 6 Search and Rescue Satellite Aided Tracking
- 7 The Global Disaster Information Network

Mitigating Natural Hazards

- 7 Coastal Hazards
- 9 Weather Hazards
- 10 Seismological Hazards

Educating about Natural Hazards

- 10 Resources for Learning
- 11 Outreach Programs
- 11 Media Coverage

Managing Natural Hazards Data

- 12 Archiving the Historical Record
- 14 Creating and Sharing Technology
- 16 Distributing Data and Information

Out of Harm's Way

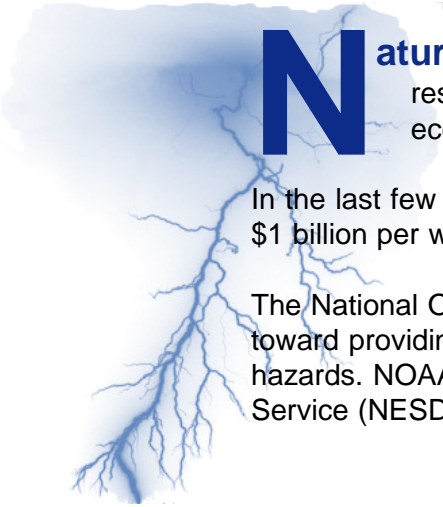
- 17 The Natural Disaster Reduction Initiative

NESDIS Contacts

- 18 Addresses, Phone Numbers, Email Addresses

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Suitland, Maryland 20233 U.S.A.
http://ns.noaa.gov/NESDIS/NESDIS_Home.html





Natural hazards threaten lives, property, natural resources, public health, and the stability of local and regional economies throughout the United States.

In the last few years, weather-related events have caused approximately \$1 billion per week in damages.

The National Oceanic and Atmospheric Administration (NOAA) is working toward providing the best possible warnings and information about natural hazards. NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) is pleased to participate in this activity.

NESDIS Assets for Observing, Analyzing, and Assessing Hazards

NESDIS operates the United States' civil geostationary and polar-orbiting environmental satellites, and manages the largest collection of atmospheric, geophysical, and oceanographic data in the world. These activities are critical in the observation, analysis, and assessment of natural hazards.

Geostationary Satellites. The Geostationary Operational Environmental Satellite (GOES) series provides continuous monitoring of Earth's atmosphere and surface over a large region of the Western Hemisphere. Imagery from these satellites may be used to monitor wildfires and potentially severe weather conditions such as snow storms, tornadoes, flash floods, hail storms, and hurricanes. Infrared channels on today's GOES satellites can help to detect forest fires, fog formation, and volcanic plumes.

NESDIS also provides a data collection system for in situ observations. This system supports land and reservoir management, river forecasts, irrigation control, water quality monitoring, fire potential analysis, and navigation.

Polar-Orbiting Satellites. Data from the Polar Orbiting Environmental Satellite (POES) series support a broad range of environmental monitoring applications including climate research, analysis, and prediction, sea surface temperature measurements, atmospheric soundings of temperature and humidity, ocean dynamics research, volcanic eruption monitoring, drought and forest fire detection, vegetation analysis, ice shelf assessment, and many other applications.

POES satellites fly the Argos Data Collection System, which collects discrete, in situ observations. The data support atmospheric and ocean analyses, forecasting, and research. Much of the data collected is available through the Global Telecommunications System of the World Meteorological Organization.

NESDIS manages the Nation's operational, environmental satellite system.

GOES satellite.



*NESDIS
manages the
largest
collection of
atmospheric,
geophysical,
and
oceanographic
data in the
world.*

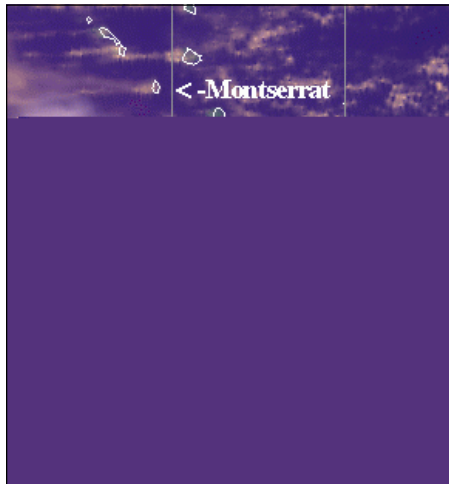
Other Satellites. In 1998, NESDIS took over the operational command and control of the U.S. Air Force's Defense Meteorological Satellite Program (DMSP). NESDIS archives data collected from three meteorological sensors on board each DMSP satellite. DMSP data have been used to monitor and assess global wildfire activity, population dynamics, and carbon dioxide emissions. NESDIS also collects near-real time data from other non-NOAA satellites. NESDIS processes data from GMS, Meteosat, TOMS, and RADARSAT to support hazards monitoring.

National Data Centers. The NOAA National Data Centers (NNDC) provide data management and accessibility to environmental data used in hazards assessment. NNDC provides data and information access to customers online and via media such as CDs, disks, tapes, and publications. This information serves a large variety of users, including scientists studying natural hazards, engineers and architects, policy makers, and emergency planners.

Detecting and Monitoring Hazards Events

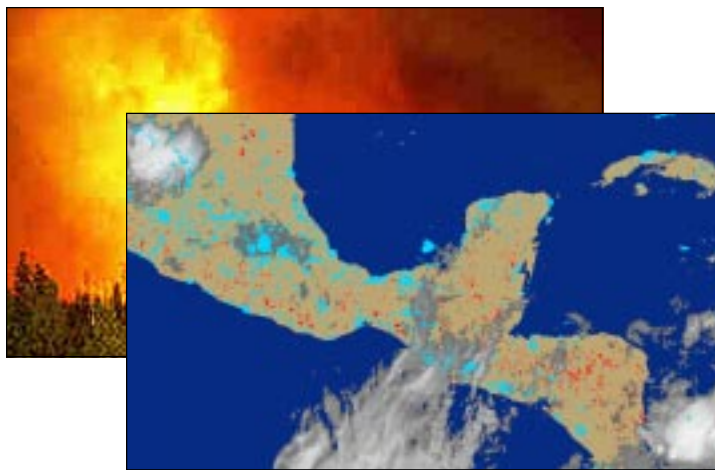
Wind Monitoring. NESDIS generates satellite-derived wind images using infrared and water vapor imagery from GOES-8 and GOES-9 satellites. These are used in numerical models by the National Weather Service. Text messages provide information for selected cities in North America.

Volcanic Ash Advisory Statements. Ash plumes injected into the atmosphere pose dangers to aircraft flying through them. NESDIS meteorologists track volcanic eruptions throughout the world and monitor all available satellite images for ash plumes. Volcanic Ash Advisory Statements are issued by NESDIS; these include text messages plus graphics. Using numerical model data, a Volcanic Ash Forecast Transport and Dispersion is produced by the National Weather Service. This information is provided to the Federal Aviation Administration, U.S. Geological Survey, to climate analysts, and scientists in other countries.



*Below: Partial Volcanic Ash Advisory Statement for Soufriere Hills Volcano, Montserrat, March 5, 1998.
Left: Photo of the volcano, July 28, 1996, by Gary Sego. NOAA-14 satellite image shows ash cloud on December 26, 1997.*

VOLCANIC ASH ADVISORY STATEMENT
ISSUED 1930 UTC 05 MAR 1998 BY THE
WASHINGTON VAAC
SOUFRIERE HILLS 98-264 WEST INDIES
16.7N 62.2W
SOURCES OF INFORMATION: GOES-8 VISIBLE
AND INFRARED AND MULTISPECTRAL
IMAGERY.
1200 UTC GUADELOUPE SOUNDING.



NESDIS fire image from DMSP data, May 20, 1998. Red spots indicate fire locations. During 1998, smoke from fires in Mexico and Central America was carried long distances by wind currents. (Background photo from the National Interagency Fire Center.)

Wildfire Detection. Wildfires pose serious hazards to human populations and to natural resources. Wildfire detection is done by NESDIS scientists using satellite technology. The GOES satellites provide frequent updates, day or night, based on multispectral imagery. The Advanced Very High Resolution Radiometer on polar-orbiting satellites senses “hot spots” with its 3.7 micron channel and also measures aerosol optical thickness. The DMSP Operational Linescan System (OLS) has the capability to detect fires at night in a light-intensified visible channel. NESDIS scientists produce images of fires observed by OLS, adding geographic references such as shorelines or country boundaries.

Precipitation Estimates. NESDIS produces satellite precipitation estimates for heavy rain (and snow) over the contiguous U.S. and Puerto Rico, concentrating primarily on locations where flash flooding is likely to occur. These estimates, along with qualitative remarks, are sent to National Weather Service field offices to aid in the issuance of watches, warnings, and special weather statements.

Tracking Tropical Cyclones. Tropical storms place thousands of people at risk from flooding, high winds, and tidal surges. Satellites have significantly improved the lead time for tropical storm forecasting. While NOAA’s Tropical Prediction Center in Miami is responsible for tracking hurricanes along the U.S. mainland, NESDIS is watching the tropics in all areas of the world. NESDIS coordinates satellite interpretations of tropical system strength and position with other NOAA facilities. NESDIS meteorologists release informational messages every six hours for tropical cyclones in the West Pacific, South Pacific, and Indian Oceans.

Monitoring Thunderstorms and Tornadoes. Research over the past decade on the short range forecasting of severe thunderstorms has shown that mesoscale air mass boundaries frequently provide the key ingredient for converting non-severe convection into severe. Detection and monitoring of these small scale boundaries with GOES satellite imagery has increased both the lead-time and accuracy of short range forecasts and warnings. NESDIS now offers special 7-minute rapid-scan interval imagery to National Weather Service forecasters on an “as needed” basis.

Data from environmental satellites are used in assessing, detecting, and forecasting severe weather and other natural hazards.

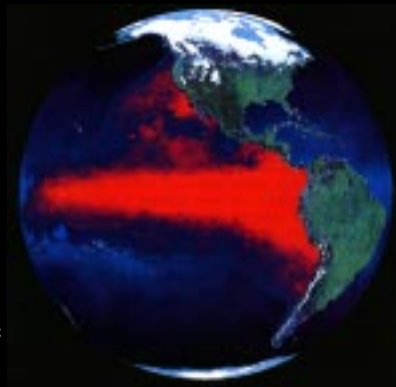
El Niño and La Niña.

El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific. This can result in significant changes in weather patterns worldwide. As El Niño fades, it is typically replaced by its mirror opposite, La Niña.

Many parts of NOAA are involved in research, assessment, monitoring, and prediction of these phenomena. NESDIS scientists develop products from satellite-derived observations of sea surface temperatures and climate anomalies.

NESDIS also creates charts depicting regions of potential coral reef bleaching related to the increased sea surface temperatures of El Niño. Ocean color studies assess the effect of El Niño on the biology and chemistry of ocean waters, such as harmful or unusual blooms of algae or other plant life, and ocean turbidity.

Other NESDIS satellite products with relevance to El Niño forecasting are monthly mean rainfall charts, ocean surface winds, and outgoing radiation and aerosols.



Composite of NOAA's satellite views of El Niño, 1997–1998 (NOAA Public Affairs).

NESDIS applies information technology to hazards response.

Responding to Natural Hazards Events

Significant Events Notification. A NESDIS team of satellite scientists and meteorologists monitor disaster-related events such as fires, floods, oil spills, snow storms, tropical storms, and volcanic activity. Using imagery from NOAA and other satellites, the team creates overlays, enhances, analyzes and annotates, and provides descriptive narratives. These materials are announced within hours of the hazards event, and are available for viewing at <http://www.osei.noaa.gov>.

Search and Rescue Satellite Aided Tracking (Sarsat). Cospas-Sarsat is an international, humanitarian search and rescue system that uses satellites to detect and locate emergency beacons carried by ships, aircraft, or individuals. It has been used extensively during weather emergencies, especially for locating craft disabled by severe storms. The system consists of a network of satellites, ground stations, mission control centers, and rescue coordination centers across the planet.

The Sarsat packages are carried on the NOAA POES and GOES satellites. (Cospas packages are carried by the Russian NADEZHDA navigation satellites.) The United States Mission Control Center, operated by NESDIS, serves as the focal point of United States' Cospas-Sarsat alert data. These data are forwarded to the U.S. Air Force and Coast Guard. To date, more than 8,000 lives have been saved by Cospas-Sarsat. The program runs 24 hours a day, every day of the year.



The Global Disaster Information Network. The Global Disaster Information Network (GDIN), an interagency effort, is now in the development phase. Work has begun on a national level, and will be extended globally. The ultimate goal is to create an effective network of early warning, mitigation, and response systems of value to all nations, at many levels of technology.

GDIN will assist in natural and technological disasters as well as complex humanitarian emergencies. NESDIS has been well represented in the initial phases of planning and continues to offer its unique experience to the process of establishing the Network.

Mitigating Natural Hazards

Planning for the possibility of natural hazards is critical, especially in geographic areas with an historically high risk of floods, earthquakes, and severe storms. Traditionally, local governments have emergency response teams or committees which draft hazard response plans after considering data, statistics, or environmental indicators. NESDIS data and analyses are used in these mitigation efforts.

Earthquake damage, San Francisco, October 1989. (NESDIS photo archive.)



Coastal Hazards. In coastal regions, environmental data are often required to track hazards such as harmful algal blooms, oil spills, pollution, unusual river discharges, and species disintegration. NESDIS works with coastal planners to mitigate the impacts of coastal hazards on public health, living marine resources, and coastal habitats.

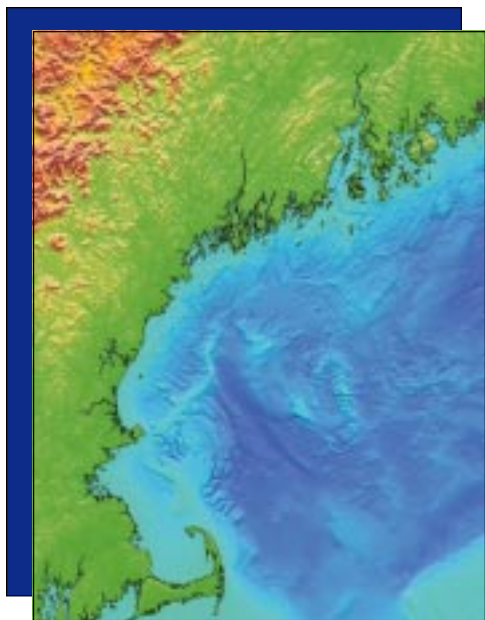
Satellite Data for Coasts and Oceans. Routine environmental analyses are provided to coastal planners and other environmental users. NESDIS schedules and distributes real-time satellite imagery products and global vegetation index data from operational and research satellites.

Coastal Characterization Models. NESDIS has pioneered ecological characterization techniques which are now being used by coastal zone managers and local agencies. These multi-layered analyses provide a more complete picture of the hazards risk than methods of the past. The models may be used in monitoring harmful algal blooms—some of which have caused near collapse of ecosystems. The models are also useful in measuring regional hypoxia (coastal dead zones).

NESDIS provides timely, relevant data and information which can be used during all phases of natural hazards planning and management.



NOAA's environmental stewardship mission includes building sustainable fisheries, recovering protected species, and sustaining healthy coasts. (NOAA photo archive.)



Coastal digital elevation models (DEMs) combine land elevations with bathymetry. This image shows the Atlantic Coast, north of Cape Cod, Massachusetts.

Coastal Relief Models. NESDIS is generating integrated coastal relief models of topography and bathymetry across shorelines at 3 arc-second latitude and longitude resolution. Earlier topography and bathymetry data extended only to the shoreline and stopped. Coastal relief models are essential for understanding coastal processes. They may also be used for predicting storm surges, tsunamis, and oil spill trajectories.

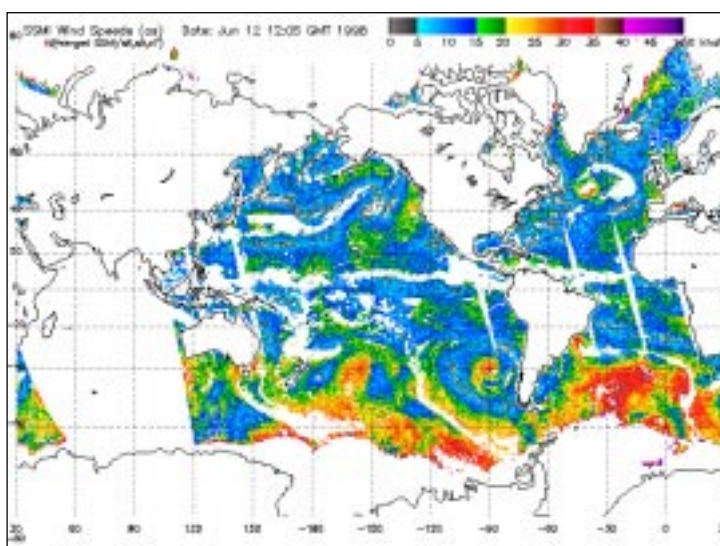
Coastal Sea Floor Data. NESDIS provides online searches of geophysical data from the coastal sea floor. These data, in combination with relief models, may be used in pollution studies and fish habitat assessment.

CoastWatch Program. NOAA's CoastWatch Program provides environmental satellite data and products to Federal and local marine scientists and coastal resource managers. These data include sea surface temperatures, wind, wave, and other marine data. (See <http://coastwatch.noaa.gov>.)

Great Lakes Bathymetry. NESDIS, other NOAA components, and the Canadian Hydrographic Service are compiling new Great Lakes bathymetry. NESDIS is also collecting existing geological and geophysical data for the Great Lakes. These data, when used in tandem, are important in decision making which affects almost 80 million people in the region. Coastal planners use this information for environmental hazards guidelines, species balance, safe navigation, and flooding mitigation.

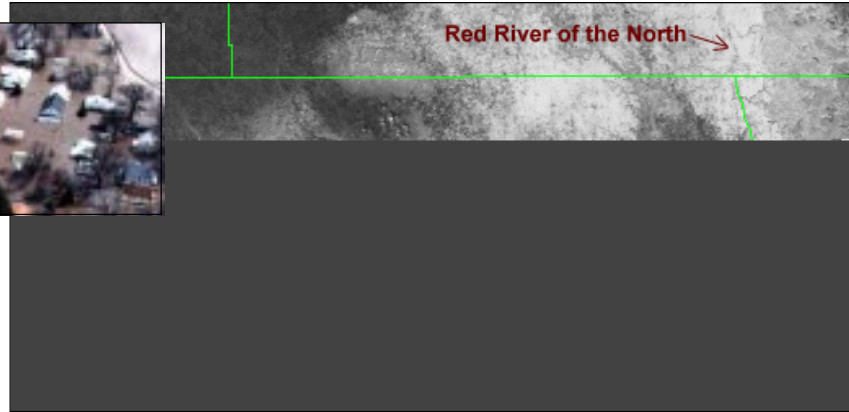
Sea Ice Analyses. The U.S. Navy/NOAA/Coast Guard National Ice Center uses visible, infrared, passive microwave, and synthetic aperture radar satellite data to produce analyses of sea ice conditions in the polar regions. These analyses are critical for the safety of vessels operating in ice-covered waters of the Arctic, Antarctic, and Great Lakes.

Ocean surface wind maps are derived from Special Sensor Microwave/Imager radiometers. These data may be applied to physical and biological models, models of ocean circulation, and fisheries resources.





Above: Grand Forks, North Dakota, residential area during the April 1997 flood. (Photo by Richard Larson, University of North Dakota.)



Northern Plains, April 12, 1997. The Red River broke the 100-year flood crest record on April 17, 1997. (NOAA-14 AVHRR Visible Channel.)

Weather Hazards. Information on daily or long-term regional weather may help in the budgeting of resources from sand bags to snow plows. Emergency agencies depend on these historical data to assess the need for equipment, supplies, and shelter space, and to coordinate volunteer activity.

Hurricane Activity. NESDIS posts online, weekly summaries of Atlantic hurricane activity. The data come from the GOES, POES, and DMSP data archives, maintained by NESDIS. NESDIS also maintains a century-scale data set of tropical cyclone tracks.

Droughts and Floods. Precipitation data to 15-minute time resolution are collected daily from thousands of weather stations. Using these data, NESDIS routinely generates products such as drought indices. These identify areas of the U.S. plagued by severe climatic conditions, while placing the events into historical perspective.

Radar Products. The Next Generation Weather Radar (NEXRAD) system is comprised of approximately 160 weather surveillance sites throughout the U.S. and selected non-U.S. locations. Each site captures meteorological base data such as reflectivity, mean radial velocity, and spectrum width. These are known as Level II data. From these data, Level III data—meteorological analysis products—are created. Level II and Level III data are archived by NESDIS. Radar products provide meteorological and ground truth data for regional planners.

Aircraft Products. Data reports from thousands of commercial aviation flights are collected monthly. These include pressure, temperature, wind direction, and wind speed. These reports are a primary source of weather information in between surface reporting points, providing valuable input to the National Weather Service Aviation Forecast program.

Snow and Ice Analysis. Northern Hemisphere Snow and Ice Charts have been produced weekly since 1966. Since 1997, daily analyses have been produced. These are compiled from satellite data and surface imagery. Snowfall and depth data are also collected from a dense U.S. network. These data are processed into products such as snow climatologies and analyses of extreme event probabilities which are used in disaster declarations.



NEXRAD radar tower. Level II and III NEXRAD data, archived by NESDIS, are useful for regional weather analyses. (NOAA photo archive.)



Collapse of the I-5 and SR-14 interchange, Northridge, California, earthquake of 1994. (NESDIS photo archive.)

Seismological Hazards. Seismological hazards, including earthquakes and tsunamis, affect both coastal and inland areas. NESDIS plays a major role in post-event data collection.

Earthquake Data. Determination of high seismic risk is critical for pre-planning and emergency response. NESDIS provides earthquake data searches to civil defense agencies, researchers, engineers, insurance companies, and to other groups directly involved with natural hazards planning. NESDIS scientists also take an active role in international forums on earthquake prediction and mitigation.

Tsunami Data. NESDIS has taken the lead in collecting valuable historical data for the Pacific Rim and most recently, for the Caribbean. These data have been used for local flood mitigation planning, and for establishing regional emergency response guidelines.

The Natural Hazards Data Resources Directory is a cooperative effort between NESDIS and the University of Colorado. The directory is organized by natural hazards topics and hazards-related organizations. The information was originally in publication form and now is available on the Web. The *Directory* is used by hazards specialists, planners, and emergency agencies around the world. (See <http://www.ngdc.noaa.gov/seg/hazard/resource/hazdir.html>.)

Educating about Natural Hazards

http://ns.noaa.gov/NESDIS/NESDIS_Home.html

Students of all ages learn about natural hazards from NESDIS Web pages and products.

- **Non-technical information:** earthquakes, tsunamis, snow storms, avalanches, El Niño and La Niña, space weather, climate models, severe weather events
- **Descriptive photos and diagrams:** earthquake damage photos, volcano photos, damage to coastal areas, hazards assessment
- **Images from satellites:** hurricanes, thunderstorms, snow cover, dust storms, droughts, wildfires, volcanic plumes
- **Satellite movies of weather events:** hurricanes, tropical storms

Resources for Learning. The Web has become a major source of information about natural hazards for students of all ages. NESDIS uses Web technology to simplify access of hazards data and information. Interactive data mapping and charting teaches about hazards hot spots and trends. Students can view online images from GOES and POES satellites to track the movement of severe storms. They can plot earthquake data and see pictures of earthquake events.

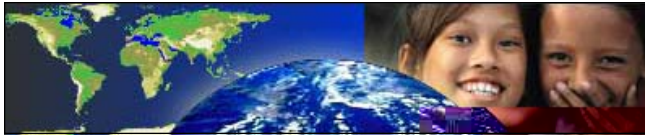
NESDIS printed publications continue to be a valuable resource for learning. Monthly journals describe local climatological data, storm data, and unusual weather phenomena. Historical compilations provide a record of seismological events, such as tsunamis and earthquakes. The publications often include easy-to-understand charts, photographs, illustrations, and narratives.

Maps and posters from NESDIS are popular choices for schools and community programs. Slide sets about hurricanes, earthquakes, volcanoes, and tsunamis teach the basics of natural hazards, and provide a colorful introduction for all ages.

Outreach Programs. One-on-one contact with local communities is an effective way to educate about natural hazards. NESDIS employees across the country participate in cooperative programs with schools and regional planning agencies. Presentations about earthquakes and volcanoes are very popular; images from the hazards slides sets are used to teach about geological hazards. NESDIS satellite images and videos are used to explain Earth's atmosphere, land, and ocean features.

NESDIS is also pleased to be part of the Global Learning and Observations to Benefit the Environment (GLOBE) Program. GLOBE is a worldwide network of students, teachers, and scientists working together to study and understand the

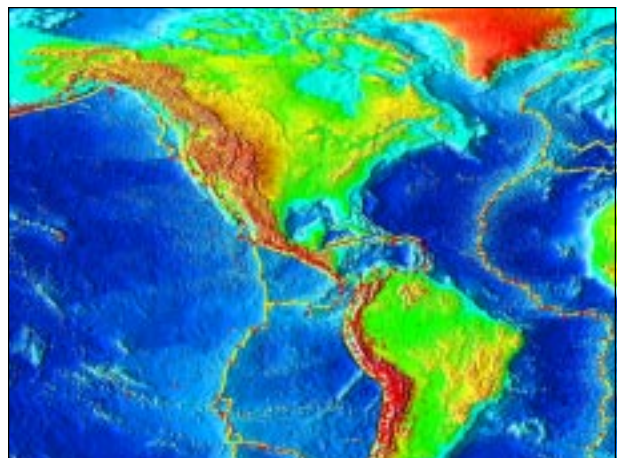
NESDIS data and products are used in schools and emergency management training programs.



global environment. GLOBE students make environmental observations at or near their schools and report their data through the Internet. Scientists use GLOBE data in their research and provide feedback to the students to enrich their science education. These activities help students reach higher levels of achievement in science and math, and also increases environmental awareness. NESDIS technical advisors work closely with the GLOBE program and also provide the GLOBE Student Data Archive.

Media Coverage. Newspapers, television, and museums have drawn on NESDIS expertise and data for educating the public about natural hazards. NESDIS images have been featured in documentaries, in museum interpretive programs, and on magazine covers. NESDIS scientists have been interviewed for national news and science programs. This outreach has made hazards support at NOAA/NESDIS more visible, and familiarizes citizens with activities at their Federal agencies.

Map of tectonic plates and epicenters, created from NESDIS data. NESDIS has publications, slide sets, and Web resources which teach about natural hazards.



Many
NESDIS data
collections
are directly
applicable to
hazards
studies.

Managing Natural Hazards Data

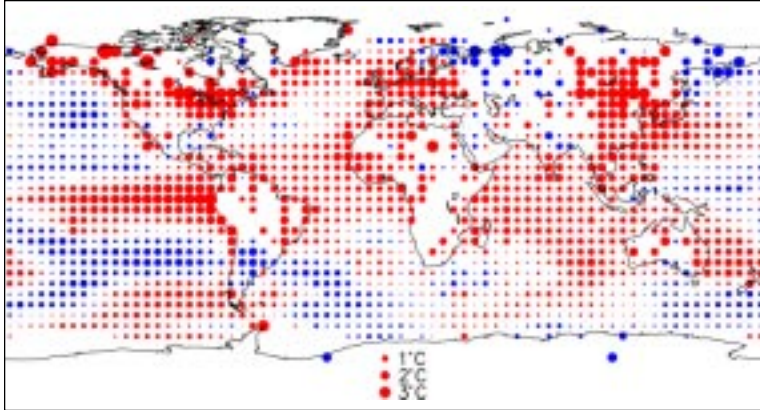
Archiving the Historical Record. The NESDIS data collections are broad in scope. Long-term data can be used to establish the past record of natural hazard event occurrences, with an eye toward the future.

Climate Observation Data. Historical climate observations may include those from land, ocean, and atmosphere. Original data come from many sources—from handwritten log books to satellite output in digital form. NESDIS has extensive collections of these data, useful for climate and ecological hazards research. Many of these collections are now online.

Geomagnetic Data. Geomagnetic storms develop when masses of highly energetic, charged particles are ejected from the Sun and, subsequently, hit Earth's magnetic field. These events may be severe enough to upset delicate technological systems on satellites and on the ground, causing interruption of communications and electric power. Data are available for study of this unusual natural hazard.

Historical Oceanographic Profile Data. These are repetitive data samples along ocean sections or at fixed stations for long time periods. Data include temperature, salinity, density, and nutrient data. Global ocean temperature and salinity profiles are also available. The data provide critical baseline information for identifying conditions which may lead to hypoxia or potentially toxic algal blooms.

Marine Environmental Buoy Database. The collection contains marine meteorological, oceanographic, and wave data collected by moored buoys and network stations operated by the NOAA National Data Buoy Center. Data also include air temperature and pressure, wind speed and direction, wind gust, sea surface temperature, wave height, wave period, and wave spectra.



This preliminary map shows global temperature anomalies, January–May, 1998. The blue dots are cool anomalies, and the red are warm anomalies. The size of the dot is proportional to the magnitude of the anomaly.

The land data are from NESDIS' Global Historical Climatology Network. Satellite, ship, and buoy data were used for the ocean areas. NESDIS has extensive collections of scientific data which may be used for climate analyses.

Paleoclimate Data. Valuable clues to past climate are buried in sediments at the bottom of the oceans, locked in coral reefs, frozen in glaciers and ice caps, or preserved in the rings of trees. Paleoflood indicators can be used to analyze the full range of extreme flooding that has occurred in specific regions. Scientists use these base data to create models of possible future climates.

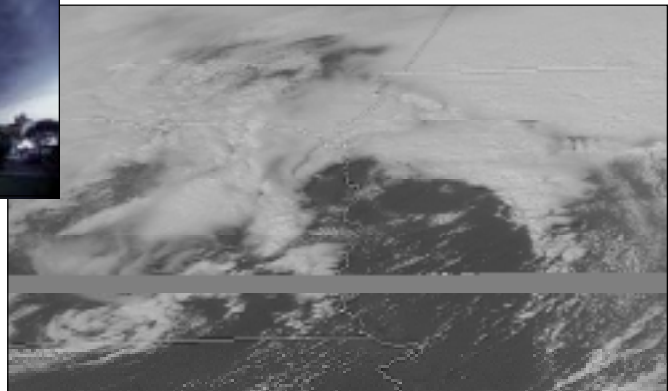
Satellite Data Archives. NESDIS archives satellite data from its geostationary and polar-orbiting satellites. The archive includes data in digital form, and thousands of photos of storms, tropical cyclones, and daily weather. Access systems allow users to search NESDIS satellite data inventories, preview sub-sampled images, and download the actual data for processing and analyses.

Seismicity Data. The NESDIS seismicity data base now contains nearly five million listed events. Data are added weekly from regional sources, keeping the data base current within several days of the earthquake event. The data base includes accelerograph records, earthquake intensity, seismological algorithms, and tsunami data. Historical photographs and publications are also available.

Snow and Ice Data. The National Snow and Ice Data Center, as part of a cooperative agreement with NOAA, archives a variety of data for use in studies of snow and ice. These include glacier, sea ice, and snow cover data, permafrost data, and polar atmosphere data.



Satellite images archived at NESDIS contribute to the understanding of severe storms. (Norman, Oklahoma, photo by Brian Curran, NOAA; GOES-8 image, U.S. midwest storms, May 1998.)





*Tornado damage to a house in Georgia, March 20, 1998. See satellite image, next page.
Photo by Bill Reckert, Federal Emergency Management Agency (FEMA).*

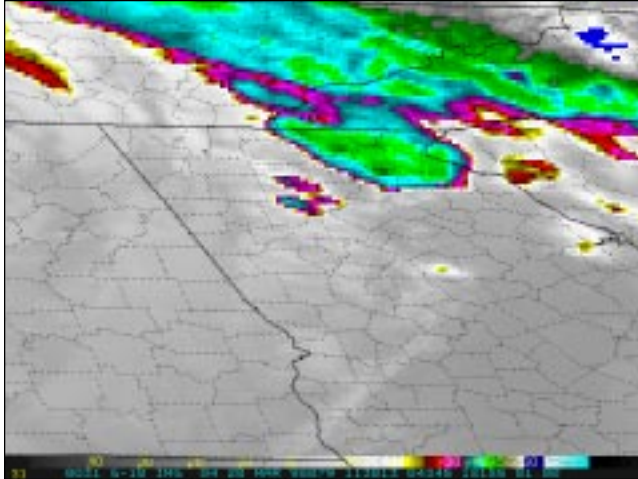
Solar Database. The NESDIS Solar Database is part of a cross-disciplinary effort within NOAA to link observed changes on the Sun with terrestrial climate. Data include sunspot numbers from 1700, coronal observations, cosmic rays, solar flares, and solar irradiance.

Storm Data and Unusual Weather Phenomena. This online NESDIS publication contains a chronological listing, by state, of hurricanes, tornadoes, thunderstorms, hail, floods, drought conditions, lightning, high winds, snow, temperature extremes, and other weather phenomena. The reports are provided by the National Weather Service and contain statistics on personal injuries and damage estimates.

U.S. Weather Disasters, 1980–1998. The U.S. has sustained some very expensive weather-related disasters over the past 19 years. Twenty-seven of these disasters occurred during the 1988–1998 period with total damages/costs exceeding \$150 billion. Data are available in digital and publication format.

World Ocean Atlas. NESDIS is working with the NOAA Climate and Global Change Program to produce compilations of world ocean data. Work to date includes quality control of historical in situ temperature, salinity, oxygen, phosphate, nitrate and silicate data, and the preparation of one-degree latitude-longitude mean fields for each of these parameters.

Creating and Sharing Technology. NESDIS data software products and systems enhance data utilization at several levels—from the data manager who organizes and distributes data to the end user who views and analyzes data. The data management techniques recognize the importance of associating metadata (documentation, articles, captions, definitions) with the data.



This satellite image product shows enhanced infrared imagery from GOES-10, March 20, 1998. The image is centered over Georgia during the time a tornado was on the ground. Eleven people were killed; damage to property was extensive.

Web technology is being adapted by NESDIS for easy display and use of hazards data. For example, NESDIS is working with the international Committee on Earth Observation Satellites (CEOS) to establish a disaster information server on the Web, utilizing satellite technologies for disaster management, mitigation, and recovery. (See <http://www.ceos.noaa.gov>.)

High-resolution digital satellite data analysis and display system workstations, created by NESDIS scientists, have been introduced into National Weather Service offices. These are used to study weather phenomenon and forecasting.

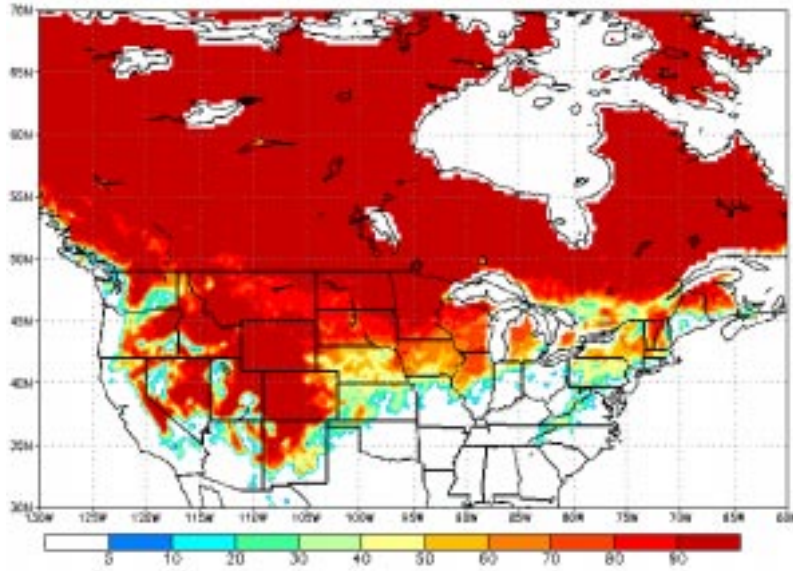
Creative use of geographic information systems technology, combined with NOAA satellite data and historical records, have led to breakthroughs in hazards detection, assessment, detection, and management.

NESDIS uses creative technology to enhance natural hazards data utilization.

Right: NOAA-12 color IR composite showing Florida fires on July 2, 1998. Red areas are locations of fire activity. Smoke plumes are visible.

Below: Portion of a FEMA map showing fires near Ormond Beach and Daytona Beach on the same day. The map was created with a geographic information system, using remotely-sensed data. Red areas are fire perimeters.





Snow cover map derived from Special Sensor Microwave/Imager data, January, 1998. This image was dynamically generated on the Web with user-defined parameters.

*NESDIS
distributes
natural
hazards data
and
information in
many formats.*

Distributing Data and Information. The NOAA National Data Centers (NNDC) provide access to many of the data holdings of NESDIS. The Data Centers have extensive historical data collections—indexed, archived, and searchable—for those doing studies on natural hazards. Data are received from a wide variety of sources, nationally and internationally. Platforms include satellites, ground observations, aircraft, ships, and weather balloons.

The Data Centers respond to requests from all over the world. There are many forms of hazards data and information dissemination: CDs, disks, magnetic tapes, publications, atlases, maps, posters, printouts, paper copies of original records, microfiche, microfilm, movie loops, photographs, slide sets, electronic mail, telephone, facsimile, and personal visit.

Current NNDC products are featured through the Online Store at <http://www.nndc.noaa.gov>

Online features include down-loadable data, data searches, graphical user interfaces, satellite products, and real-time satellite imagery. Dynamically-generated Web pages provide data display options tailored for the user.

NESDIS works diligently to distribute timely hazards data and information to emergency managers, educators, scientists, and the public. Information technology continues to transform the data distribution process, allowing quicker access to data essential to natural hazards research and mitigation.

Out of Harm's Way

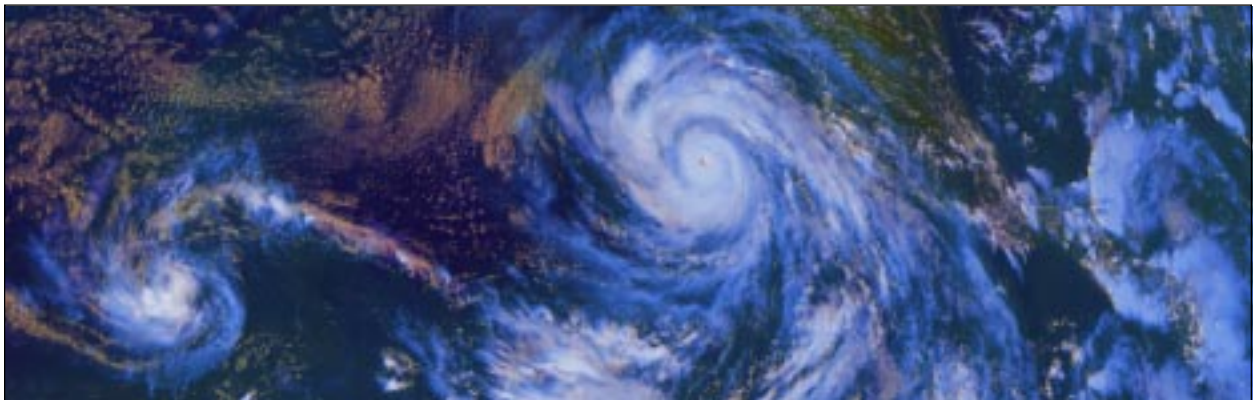
On March 3, 1998, U.S. Department of Commerce Secretary William M. Daley announced the **Natural Disaster Reduction Initiative** (NDRI). NDRI is an interagency effort to reduce and mitigate the direct and indirect costs of natural disasters. NDRI will:

- improve building construction techniques to resist weather, seismic, and fire disasters
- improve prediction of damaging weather and related river flooding
- help communities and businesses safeguard jobs in hazard-prone areas

The costs of natural hazards are projected to increase if steps are not taken to help communities reduce their vulnerability and prevent natural hazards from becoming uncontrolled disasters.

While we cannot control the forces of nature and the devastations they cause, we can do three things: move out of harm's way, keep out of harm's way, and promote long-term recovery. NESDIS programs will continue to be an important element in reaching these goals.

*Hurricane Linda,
September 12, 1997.
(GOES-9, Channel 1, 3, 4)*



"The Commerce Department's Natural Disaster Reduction Initiative will help save lives and protect property. We will be working closely with the Federal Emergency Management Agency, the Interior Department, and other Federal agencies, with state and local governments, and with our nation's businesses."

William M. Daley, Secretary of Commerce



NESDIS Contacts

Web sites are accessible through the NESDIS home page at:
http://ns.noaa.gov/NESDIS/NESDIS_Home.html

Environmental Information Services

1315 East West Highway
 Silver Spring, MD 20910
 (301) 713-3578
help@esdim.noaa.gov

NESDIS Public Affairs
 Federal Building 4
 Washington, DC 20233
 (301) 457-5005
pviet@nesdis.noaa.gov

Office of Research and Applications
 NOAA Science Center
 Washington, DC 20233
 (301) 763-8282
neverson@nesdis.noaa.gov

Office of Satellite Data Processing and Distribution
 Federal Building 4
 Washington, DC 20233
 (301) 457-5681
satinfo@ssd.wwb.noaa.gov

Office of Satellite Operations
 Federal Building 4
 Washington, DC 20233
 (301) 457-5208
gdavis@nesdis.noaa.gov

Office of Systems Development
 Federal Building 4
 Washington, DC 20233
 (301) 457-5208
gdavis@nesdis.noaa.gov

NOAA National Data Centers:

National Climatic Data Center
 151 Patton Avenue
 Asheville, NC 28801-5001
 (704) 271-4800
orders@ncdc.noaa.gov

National Geophysical Data Center
 325 Broadway
 Boulder, CO 80303-3328
 (303) 497-6826
info@ngdc.noaa.gov

National Oceanographic Data Center
 1315 East-West Highway
 Silver Spring, MD 20910-3282
 (301) 713-3277
services@nodc.noaa.gov

Snow and Ice Data:

National Ice Center
 Federal Building #4
 Washington, DC 20395
 (301) 457-5300
<http://www.natice.noaa.gov>
liaison@natice.noaa.gov

National Snow and Ice Data Center
 University of Colorado
 Campus Box 449
 Boulder, CO 80309-0449
 (303) 492-6199
<http://www-nsidc.colorado.edu>
nsidc@kryos.colorado.edu

Satellite Programs:

GOES: <http://www.goes.noaa.gov>
 POES: <http://www.saa.noaa.gov>
 DMSP: <http://www.ngdc.noaa.gov/dmsp/>